

SCANNING L-BAND ACTIVE PASSIVE (SLAP)—RECENT RESULTS FROM AN AIRBORNE SIMULATOR FOR SMAP

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1. INTRODUCTION

Scanning L-band Active Passive (SLAP) is a recently-developed NASA airborne instrument specially tailored to simulate the new Soil Moisture Active Passive (SMAP) satellite instrument suite [1]. SLAP conducted its first test flights in December, 2013 and participated in its first science campaign—the IPHEX ground validation campaign of the GPM mission—in May, 2014. This paper will present results from additional test flights and science observations scheduled for 2015.

2. DESCRIPTION OF SLAP

SLAP has both passive (radiometer) and active (radar) microwave L-band imaging capabilities [2]. The radiometer observes at 1.4 GHz using duplicate front end hardware from the SMAP satellite radiometer. It also includes a duplicate of the digital backend development unit for SMAP, thus the novel Radio Frequency Interference (RFI) detection and mitigation features and algorithms for SMAP are duplicated with very high fidelity in SLAP. The digital backend provides 4-Stokes polarization capability. The real-aperture radar operates as a scatterometer in the 1215-1300 MHz band with quad-pol capability. Radar and radiometer share one antenna via diplexers that are spare units from the Aquarius satellite instrument.

3. PREVIOUS FLIGHT RESULTS

SLAP's initial flights were conducted in December 2013 over the eastern shore of Maryland and successfully demonstrated radiometer imaging over 2 full SMAP 36x36 km grid cells at ~1km resolution within 3 hrs (Figure 1). A second flight on the same day also demonstrated SLAP's quick-turn abilities and high-resolution/wide-swath capabilities with 200m resolution across a 1500m swath from 2000 ft AGL (Figure 2). Additional flights were conducted as part of the GPM iPHEX campaign in May, 2014 [3]. Figure 3 is an example of simultaneous radiometer and radar imagery from this campaign. Imagery from these previous flights will be reviewed.

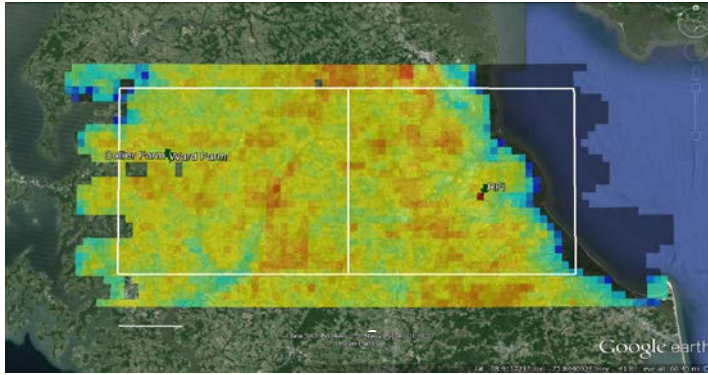


Figure 1. Two 36x36 km SMAP grid cells (white squares) imaged by SLAP radiometer from 11000 ft AGL in December, 2013, yielding 1.3km resolution. Note cooler thin blue brightness temperatures features following rivers and red RFI hotspot.

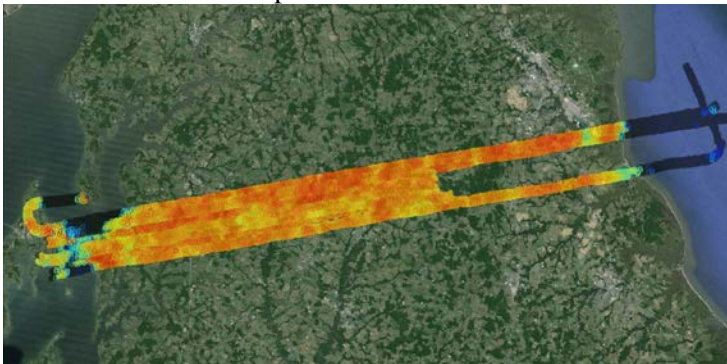


Figure 2. 260m resolution radiometer imagery from December 2013 demonstrating high-resolution capabilities.

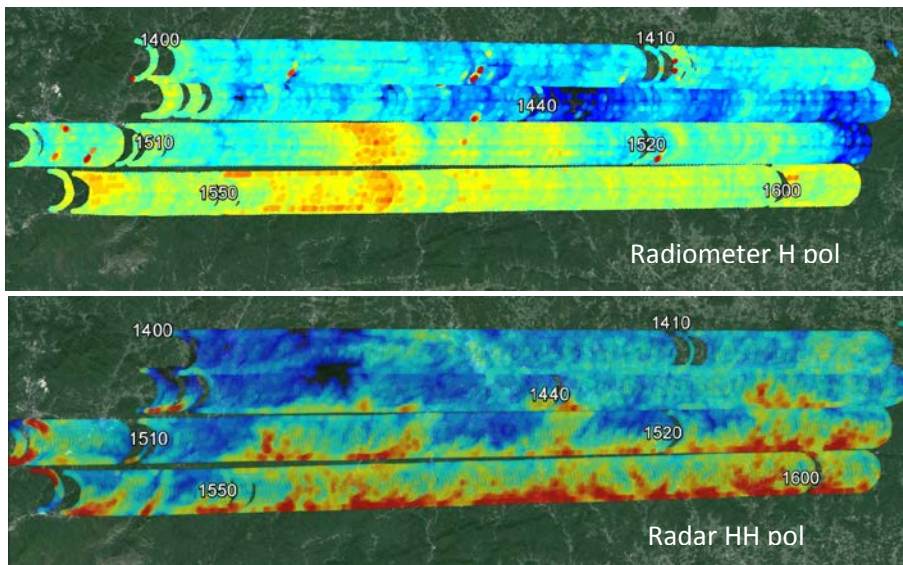


Figure 3. Simultaneous radiometer (top) and radar (bottom) imagery from IPHEX campaign. NE-facing fore half scans. Resolution varies from 200m to 1000m due to variable topography.

4. NEW FLIGHT RESULTS

Additional SLAP engineering flights are scheduled for early 2015 to a) demonstrate operations on the second King Air aircraft available at NASA Langley Research Center, and b) to refine the calibration of both the radiometer and the radar. Results from these flights will be presented and discussed. Preliminary imagery and results from science flights scheduled for summer 2015 will also be discussed.

11. REFERENCES

- [1] Entekhabi, D.; et al, "The Soil Moisture Active Passive (SMAP) Mission," *Proceedings of the IEEE* , vol.98, no.5, pp.704,716, May 2010.
- [2] E.Kim, et al, "Scanning L-Band Active Passive (SLAP)—A New Airborne Soil Moisture Sensor," MicroRad 2014 conference, Pasadena, March, 2014.
- [3] E.Kim, et al, "Scanning L-Band Active Passive (SLAP)—Flight Results From a New Airborne Simulator for SMAP," fall 2014 AGU meeting. San Francisco, December, 2014.